

FUNCTIONAL TASK TEST: 1) SENSORIMOTOR CHANGES ASSOCIATED WITH POSTFLIGHT ALTERATIONS IN ASTRONAUT FUNCTIONAL TASK PERFORMANCE

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INTRODUCTION: Space flight is known to cause alterations in multiple physiological systems including changes in sensorimotor, cardiovascular, and neuromuscular systems. These changes may affect a crewmember's ability to perform critical mission tasks immediately after landing on a planetary surface. The overall goal of this project is to determine the effects of space flight on functional tests that are representative of high priority exploration mission tasks and to identify the key underlying physiological factors that contribute to decrements in performance. This presentation will focus on the sensorimotor contributions to postflight functional performance. The cardiovascular and neuromuscular components are described in the following abstracts: Functional Task Test 2 and 3.

METHODS: Astronauts were tested using an interdisciplinary protocol that evaluated functional performance and related physiological changes. Functional tests include ladder climbing, hatch opening, jump down, manual manipulation of objects and tool use, seat egress and obstacle avoidance, recovery from a fall and object translation tasks. Physiological measures included assessments of sensorimotor, cardiovascular and neuromuscular function. Sensorimotor tests included measures of postural equilibrium control and gait stability, dynamic visual acuity and fine motor control. Crewmembers were tested before and after Shuttle missions. Currently astronauts are participating in this study before and after ISS flights. Data were collected on two sessions before flight, on landing day (Shuttle only) and 1, 6 and 30 days after landing. To date we have completed data collection on 7 Shuttle and 4 ISS crewmembers.

RESULTS: Preliminary analysis on Shuttle data showed that functional tests that required dynamic control of postural equilibrium to complete (fall recovery, seat egress/obstacle avoidance during walking, object translation, jump down) demonstrated the greatest postflight changes in performance. Sensorimotor tests sensitive to the vestibular component underlying postural and gait control showed the largest postflight alterations.

DISCUSSION: Initial results indicate that space flight causes alterations in the ability to perform postflight functional tasks. This change in functional performance is linked to postflight alterations in vestibular function leading to decrement in performance for tasks with greater requirements for dynamic postural equilibrium control. Data collection continues on ISS subjects with the eventual overall goal to map changes in functional task performance to alterations in sensorimotor, cardiovascular and neuromuscular function. This will allow for the implementation of countermeasures that specifically target the physiological factors that impact functional performance.